



General

Guideline Title

Congress of Neurological Surgeons systematic review and evidence-based guidelines on surgical resection for the treatment of patients with vestibular schwannomas.

Bibliographic Source(s)

Hadjipanayis CG, Carlson ML, Link MJ, Rayan TA, Parish J, Atkins T, Asher AL, Dunn IF, Corrales CE, Van Gompel JJ, Sughrue M, Olson JJ. Congress of Neurological Surgeons systematic review and evidence-based guidelines on surgical resection for the treatment of patients with vestibular schwannomas. *Neurosurgery*. 2018 Feb 1;82(2):E40-3. [20 references] [PubMed](#)

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report [Clinical Practice Guidelines We Can Trust](#).

■■■■= Poor ■■■■= Fair ■■■■= Good ■■■■= Very Good ■■■■= Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
■■■■	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition
YES	Multidisciplinary Group

UNKNOWN	Methodologist Involvement
■□□□□	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
■■■■■	Search Strategy
■■■■■	Study Selection
■■■■■	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
■■■□□	Grading the Quality or Strength of Evidence
■■■■■	Benefits and Harms of Recommendations
■■■■■	Evidence Summary Supporting Recommendations
■■■■■	Rating the Strength of Recommendations
■■■■■	Specific and Unambiguous Articulation of Recommendations
■□□□□	External Review
■■■□□	Updating

Recommendations

Major Recommendations

Definitions for the classification of evidence (I-III) and levels of recommendations (1-3) are provided at the end of the "Major Recommendations" field.

Please see the full-text version of this guideline (see the "Availability of Companion Documents" field) for the target population of each recommendation listed below.

Question 1

What surgical approaches for vestibular schwannomas (VSs) are best for complete resection and facial nerve (FN) preservation when serviceable hearing is present?

Recommendation

There is insufficient evidence to support the superiority of either the MF or the RS approach for complete VS resection and FN preservation when serviceable hearing is present.

Question 2

Which surgical approach (RS or translabyrinthine [TL]) for VS is best for complete resection and FN preservation when serviceable hearing is not present?

Recommendation

There is insufficient evidence to support the superiority of either the RS or the TL approach for complete VS resection and FN preservation when serviceable hearing is not present.

Question 3

Does VS size matter for facial and vestibulocochlear nerve preservation with surgical resection?

Recommendation

Level 3: Patients with larger VS tumor size should be counseled about the greater than average risk of loss of serviceable hearing.

Question 4

Should small intracanalicular tumors (<1.5 cm) be surgically resected?

Recommendation

There are insufficient data to support a firm recommendation that surgery be the primary treatment for this subclass of VSs.

Question 5

Is hearing preservation routinely possible with VS surgical resection when serviceable hearing is present?

Recommendation

Level 3: Hearing preservation surgery via the MF or the RS approach may be attempted in patients with small tumor size (<1.5 cm) and good preoperative hearing.

Question 6

When should surgical resection be the initial treatment in patients with neurofibromatosis type 2 (NF2)?

Recommendation

There is insufficient evidence that surgical resection should be the initial treatment in patients with NF2.

Question 7

Does a multidisciplinary team, consisting of neurosurgery and neurotology, provide the best outcomes of complete resection and facial/vestibulocochlear nerve preservation for patients undergoing resection of VSs?

Recommendation

There is insufficient evidence to support stating that a multidisciplinary team, usually consisting of a neurosurgeon and a neurotologist, provides superior outcomes compared to either subspecialist working alone.

Question 8

Does a subtotal surgical resection of a VS followed by stereotactic radiosurgery (SRS) to the residual tumor provide comparable hearing and FN preservation to patients who undergo a complete surgical resection?

Recommendation

There is insufficient evidence to support subtotal resection (STR) followed by SRS provides comparable hearing and FN preservation to patients who undergo a complete surgical resection.

Question 9

Does surgical resection of VS treat preoperative balance problems more effectively than SRS?

Recommendation

There is insufficient evidence to support either surgical resection or SRS for treatment of preoperative balance problems.

Question 10

Does surgical resection of VS treat preoperative trigeminal neuralgia more effectively than SRS?

Recommendation

Level 3: Surgical resection of VSs may be used to better relieve symptoms of trigeminal neuralgia than SRS.

Question 11

Is surgical resection of VSs more difficult (associated with higher facial neuropathies and STR rates) after initial treatment with SRS?

Recommendation

Level 3: If microsurgical resection is necessary after SRS, it is recommended that patients be counseled that there is an increased likelihood of a STR and decreased FN function.

Definitions

American Association of Neurological Surgeons/Congress of Neurological Surgeons Classification of Evidence on Therapeutic Effectiveness

Evidence Classification	
Class I Evidence	Evidence provided by one or more well-designed randomized controlled clinical trials, including overview (meta-analyses) of such trials
Class II Evidence	Evidence provided by well-designed observational studies with concurrent controls (e.g., case-control and cohort studies)
Class III Evidence	Evidence provided by expert opinion, case series, case reports, and studies with historical controls

American Association of Neurological Surgeons/Congress of Neurological Surgeons Levels of Recommendation

Levels of Recommendation	
Level 1	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires class I evidence which directly addresses the clinical questions or overwhelming class II evidence when circumstances preclude randomized clinical trials)
Level 2	Recommendations for patient management which reflect clinical certainty (usually this requires class II evidence or a strong consensus of class III evidence)
Level 3	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Vestibular schwannomas

Guideline Category

Assessment of Therapeutic Effectiveness

Treatment

Clinical Specialty

Neurological Surgery

Neurology

Otolaryngology

Intended Users

Physicians

Guideline Objective(s)

To assess both comparative and noncomparative studies of surgical management of vestibular schwannomas (VSs)

Target Population

- Adults with sporadic vestibular schwannomas (VSs) who underwent microsurgical resection or stereotactic radiosurgery (SRS) treatment
- Adults with both sporadic and neurofibromatosis type 2 (NF2) VSs undergoing microsurgical resection
- Patients meeting diagnostic criteria for NF2

Interventions and Practices Considered

1. Complete surgical resection
2. Counseling
3. Hearing preservation surgery

Note: The following interventions were considered but not recommended due to insufficient evidence:

- Multidisciplinary team
- Subtotal resection followed by stereotactic radiosurgery (SRS)

Major Outcomes Considered

- Facial/vestibulocochlear nerve function
- Hearing preservation rates
- Patient perceived disability in regards to hearing loss
- Quality of life
- Tumor control rates
- Balance/vestibular dysfunction

- Trigeminal neuralgia symptoms

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Search Method

The task force collaborated with a medical librarian to search for articles published from January 1990 through 2014. Two electronic databases, PubMed and the Cochrane Central Register of Controlled Trials (see the full guideline for search strategies [see the "Availability of Companion Documents" field]), were searched. Strategies for searching electronic databases were constructed by the evidence-based clinical practice guideline taskforce members and the medical librarian using standard strategies to identify relevant studies.

The authors supplemented the searches of electronic databases with manual screening of the bibliographies of all retrieved publications. The authors also searched the bibliographies of recent systematic reviews and other review articles for potentially relevant citations. All articles identified were subject to the study selection criteria listed below. As noted above, the guideline committee also examined lists of included and excluded studies for errors and omissions. The authors went to great lengths to obtain a complete set of relevant articles. Having a complete set ensured that this guideline is not based on a biased subset of articles.

Study Selection and Eligibility Criteria

A total of 2949 citations were manually reviewed by the team with specific inclusion and exclusion criteria as outlined below. Two independent reviewers evaluated and abstracted full-text data for each article, and the 2 sets of data were compared for agreement by a third party. Inconsistencies were re-reviewed, and disagreements were resolved by consensus. Citations that considered adult patients focusing on surgical treatment of VSs were considered. To be included in this guideline, an article must be a report of a study that:

- Investigated patients suspected of having vestibular schwannomas (VSs)

- Patients ≥ 18 years of age

- Was of humans

- Published between January 1, 1990 and December 31, 2014

- Quantitatively presented results

- Was not an in vitro study (for novel molecular markers, in vitro studies were included on patient samples)

- Was not a biomechanical study

- Was not performed on cadavers

- Was published in English

- Was not a meeting abstract, editorial, letter, or commentary

- Studies may include mixed pathology; however, the data pertaining to VSs was abstractable from the paper

- Had >5 patients or patient samples

The authors did not include systematic reviews, guidelines, or meta-analyses conducted by others. These documents are developed using different inclusion criteria than those specified in this guideline. Therefore, they may include studies that do not meet the inclusion criteria specified above. These documents were recalled if their abstract suggested that they might address one of the recommendations, and their bibliographies were searched for additional studies.

Number of Source Documents

One hundred forty-seven studies were included as evidence. See Figure 1 in the full guideline (see the "Availability of Companion Documents" field).

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

American Association of Neurological Surgeons/Congress of Neurological Surgeons Classification of Evidence on Therapeutic Effectiveness

Evidence Classification	
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Class II Evidence	Evidence provided by well-designed observational studies with concurrent controls (e.g., case-control and cohort studies)
Class III Evidence	Evidence provided by expert opinion, case series, case reports, and studies with historical controls

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Data Collection Process

The abstracts that met the selection criteria were retrieved in full-text form. Each article's adherence to the selection criteria was confirmed. To determine how the data could be classified, the information in the full-text articles were then evaluated to determine whether they were providing results of therapy or were more centered on diagnostic or prognostic information. Agreement on these assessments and on the salient points regarding the type of study design and objectives, and the conclusions and data classification was then reached by exchanging drafts and comments by e-mail. The information was then used for construction of the evidence tables.

Assessment for Risk of Bias

All the literature reviewed was class III evidence (i.e., evidence from nonexperimental descriptive studies, such as comparative studies, correlation studies, and case-control studies). Because the data analyzed were all class III, bias could be present because of selective case choice for study and selective results reporting, lack or loss of information over time, the biases of the interpreting investigator in regard to the study, publication bias regarding positive studies or positive cases, misclassification, survivorship bias, publication bias, recognition that data collected in this retrospective or prospective

manner does not imply causation, selection bias, attrition bias, change in methods over time, ascertainment bias, hidden agenda bias, and variability caused by random error related to problems with unintentional data entry oversight and neglect.

Methods Used to Formulate the Recommendations

Expert Consensus (Nominal Group Technique)

Description of Methods Used to Formulate the Recommendations

Writing Group and Question Establishment

The evidence-based clinical practice guideline taskforce members and the Joint Tumor Section of the American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons (CNS) have prioritized writing the guidelines for management of vestibular schwannomas (VSs). A series of authors for the development of guidelines related to surgical management of VSs were identified and screened for conflict of interest. This group in turn agreed on a set of questions addressing the topic at hand and conducted a systematic review of the literature relevant to the surgical management of VSs. Additional details of the systematic review are provided within the introduction and methodology chapter of the original guideline document (see the "Availability of Companion Documents" field).

Classification of Evidence and Guideline Recommendation Formulation

The concept of linking evidence to recommendations has been further formalized by the American Medical Association (AMA) and many specialty societies, including AANS, CNS, and the American Academy of Neurology (AAN). This formalization involves the designation of specific relationships between the strength of evidence and the strength of recommendations to avoid ambiguity. In the paradigm for therapeutic maneuvers, evidence is classified according to the scheme in the "Rating Scheme for the Strength of the Evidence" and "Rating Scheme for the Strength of the Recommendations" fields). A basis for these guidelines can be viewed in the Joint Guidelines Committee methodology document (see the "Availability of Companion Documents" field).

Guideline Panel Consensus

Multidisciplinary writing groups were created for each section based on author expertise to address each of the disciplines and particular areas of therapy selected for these clinical guidelines. Each group was involved with literature selection, creation and editing of the evidence tables, and scientific foundations for their specific section and discipline. Using this information, the writing groups then drafted the recommendations in answer to the questions formulated at the beginning of the process, culminating in the clinical practice guideline for their respective discipline. The draft guidelines were then circulated to the entire clinical guideline panel to allow for multidisciplinary feedback, discussion, and ultimately approval.

Rating Scheme for the Strength of the Recommendations

American Association of Neurological Surgeons/Congress of Neurological Surgeons Levels of Recommendation

Levels of Recommendation	
Level 1	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires class I evidence which directly addresses the clinical questions or overwhelming class II evidence when circumstances preclude randomized clinical trials)
Level 2	Recommendations for patient management which reflect clinical certainty (usually this requires class II evidence or a strong consensus of class III evidence)

Level 3	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Levels of Recommendation

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Approval Process

The completed evidence-based clinical practice guidelines for the management of vestibular schwannomas (VSs) were presented to the Joint Guideline Committee (JGC) of the American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons (CNS) for review. The reviewers for the JGC were vetted by *Neurosurgery* for suitability and expertise to serve as reviewers for the purposes of publication in that journal also. The final product was then approved and endorsed by the executive committees of both the AANS and CNS before publication in *Neurosurgery*.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate use of surgical resection to treat patients with vestibular schwannomas (VSs)

Potential Harms

- It should be noted that in expert hands hearing loss or complications can occur with surgery.
- In one study, the authors described how using various classification systems to measure the postoperative hearing can give a false sense of success.

Qualifying Statements

Qualifying Statements

Disclaimer of Liability

This clinical systematic review and evidence-based guideline was developed by a multidisciplinary physician volunteer task force and serves as an educational tool designed to provide an accurate review of the subject matter covered. These guidelines are disseminated with the understanding that the recommendations by the authors and consultants who have collaborated in their development are not meant to replace the individualized care and treatment advice from a patient's physician(s). If medical advice or assistance is required, the services of a competent physician should be sought. The proposals contained in these guidelines may not be suitable for use in all circumstances. The choice to implement any particular recommendation contained in these guidelines must be made by a managing physician in light of the situation in each particular patient and on the basis of existing resources.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Hadjipanayis CG, Carlson ML, Link MJ, Rayan TA, Parish J, Atkins T, Asher AL, Dunn IF, Corrales CE, Van Gompel JJ, Sughrue M, Olson JJ. Congress of Neurological Surgeons systematic review and evidence-based guidelines on surgical resection for the treatment of patients with vestibular schwannomas. *Neurosurgery*. 2018 Feb 1;82(2):E40-3. [20 references] [PubMed](#)

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2018 Feb 1

Guideline Developer(s)

Congress of Neurological Surgeons - Professional Association

Source(s) of Funding

These evidence-based clinical practice guidelines were funded exclusively by the Congress of Neurological Surgeons and the Tumor Section of the Congress of Neurological Surgeons and the American Association of Neurological Surgeons, which received no funding from outside commercial sources to support the development of this document.

Guideline Committee

Vestibular Schwannoma Evidence-Based Practice Guideline Task Force

Composition of Group That Authored the Guideline

Task Force Members: Constantinos G. Hadjipanayis, MD, PhD, Department of Neurosurgery, Mount Sinai Beth Israel, Icahn School of Medicine at Mount Sinai, New York, New York; Matthew L. Carlson, MD, Department of Otorhinolaryngology and Department of Neurologic Surgery, Mayo Clinic School of Medicine, Rochester, Minnesota; Michael J. Link, MD, Department of Neurologic Surgery, Mayo Clinic, Rochester, Minnesota; Tarek A. Rayan, MD, PhD, Department of Neurologic Surgery, Mayo Clinic, Rochester, Minnesota; John Parish, MD, Department of Neurosurgery, Carolinas Medical Center, Charlotte, North Carolina; Tyler Atkins, MD, Department of Neurosurgery, Carolinas Medical Center, Charlotte, North Carolina; Anthony L. Asher, MD, Carolina Neurosurgery and Spine Associates, Charlotte, North Carolina; Ian F. Dunn, MD, Department of Neurosurgery, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; C. Eduardo Corrales, MD, Division of Otolaryngology-Head and Neck Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; Jamie J. Van Gompel, MD, Department of Otorhinolaryngology and Department of Neurologic Surgery, Mayo Clinic School of Medicine, Rochester, Minnesota; Michael Sughrue, MD, Department of Neurosurgery, University of Oklahoma, Oklahoma City, Oklahoma; Jeffrey J. Olson, MD, Department of Neurosurgery, Emory University School of Medicine, Atlanta, Georgia

Financial Disclosures/Conflicts of Interest

Conflict of Interest

The Vestibular Schwannoma Guidelines Task Force members were required to report all possible conflicts of interest (COIs) prior to beginning work on the guideline, using the COI disclosure form of the American Association of Neurological Surgeons/Congress of Neurological Surgeons (AANS/CNS) Joint Guidelines Committee, including potential COIs that are unrelated to the topic of the guideline. The CNS Guidelines Committee and Guideline Task Force Chair reviewed the disclosures and either approved or disapproved the nomination. The CNS Guidelines Committee and Guideline Task Force Chair are given latitude to

approve nominations of Task Force members with possible conflicts and address this by restricting the writing and reviewing privileges of that person to topics unrelated to the possible COIs. The conflict of interest findings are provided in detail in the full-text introduction and methods manuscript (see the "Availability of Companion Documents" field).

Guideline Endorser(s)

American Association of Neurological Surgeons - Medical Specialty Society

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the [Neurosurgery Web site](#) .

Availability of Companion Documents

The following are available:

Congress of Neurological Surgeons systematic review and evidence-based guidelines on surgical resection for the treatment of patients with vestibular schwannomas. Full guideline. Schaumburg (IL): Congress of Neurological Surgeons (CNS); 2017 Dec 22. 116 p. Available from the [Congress of Neurological Surgeons \(CNS\) Web site](#) .

Congress of Neurological Surgeons systematic review and evidence-based guidelines on the treatment of adults with vestibular schwannomas: introduction and methods. Schaumburg (IL): Congress of Neurological Surgeons (CNS); 2017 Dec 22. 28 p. Available from the [CNS Web site](#) .

Olson JJ, Kalkanis SN, Ryken TC. Congress of Neurological Surgeons systematic review and evidence-based guidelines on the treatment of adults with vestibular schwannomas: executive summary. *Neurosurgery*. 2018 Feb 1;82(2):129-34. Available from the [Neurosurgery Web site](#) .

Congress of Neurological Surgeons (CNS). Guideline development methodology: endorsed by the American Association of Neurological Surgeons (AANS), the Congress of Neurological Surgeons (CNS), and the AANS/CNS Joint Guideline Committee. Schaumburg (IL): Congress of Neurological Surgeons (CNS); 2012 Feb. 12 p. Available from the [CNS Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on May 7, 2018. The information was verified by the guideline developer on June 4, 2018.

This NEATS assessment was completed by ECRI Institute on April 25, 2018. The information was verified by the guideline developer on June 4, 2018.

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